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EXAMINER

DOVE, TRACY MAE

ART UNIT

PAPER NUMBER

1745

DATE MAILED: 08/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/932,050

Applicant(s)

ATSUMI ET AL.

Examiner

Tracy Dove

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,4,8,9,14-19 and 21-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4,8,9,14-19 and 21-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

This Office Action is in response to the communication filed on 6/29/04. Applicant's arguments have been considered, but are not persuasive. Claims 1, 4, 8, 9, 14-19 and 21-26 are pending. Claims 2, 3, 5-7, 10-13 and 20 have been canceled.

***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/29/04 has been entered.

***Specification***

The disclosure is objected to because of the following informalities: page 5 recites  $\text{Li}_x\text{Fe}_2(\text{PO}_4)_3$  as a compound having an olivine structure. However, this compound does not have an olivine structure, but has a NASICON structure. Furthermore, in the formula  $x=3$  or  $x=5$  which does not fall within the claimed range for "x" disclosed in the specification ( $0 < x \leq 2$ ).

Appropriate correction is required.

The disclosure is objected to because of the following informalities: on page 7 the specification recites an alloy " $\text{Mg}_2\text{SaANi}_z\text{Si}$ ", which is not clear and concise. Specifically, neither "Sa" nor "A" are recognized elements and the subscript "z" is not defined. Furthermore, the specification recites the formula " $\text{D}_s\text{E}_t\text{Li}_u$ " on page 7, but does not define "E".

Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

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The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1, 4, 8, 9, 14-19 and 21-26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 1 and 4 recite a chemical formula  $\text{Li}_x\text{Fe}_y\text{PO}_4$  wherein  $1 < x \leq 2$  and  $1 \leq y \leq 2$ . The recited subscripts result in an inoperative chemical formula/structure. Specifically, the range for y of  $1 < y \leq 2$  cannot provide a value for "x" that falls within the claimed range. In the formula, the "PO<sub>4</sub>" anion has a charge of 3-, (PO<sub>4</sub>)<sup>3-</sup>, and Fe has a valance of Fe<sup>2+</sup> or Fe<sup>3+</sup> (see Hawley's Condensed Chemical Dictionary, page 647). Thus, in the formula  $\text{Li}_x\text{Fe}_y\text{PO}_4$ , y cannot be 2 because the positive charge of the compound (4+ or 6+) cannot be balanced with the negative charge of the phosphate anion (3-). Furthermore, in the formula  $\text{Li}_x\text{Fe}_y\text{PO}_4$  x cannot be in the range  $1 < x \leq 2$  because x must be x=0 or x=1 due to the anionic charge of phosphate and the valance of iron (note y must be equal to one). Examiner points out page 5 of the present specification that discloses " $\text{Li}_x\text{FePO}_4$ " and " $\text{LiFePO}_4$ " wherein y=1.

Claims 1, 4, 8, 9, 14-19 and 21-26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1 and 4 have been amended to recite " $1 < x \leq 2$ ", however, this range

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for "x" is not supported by the specification as filed. Range endpoints must have support in the specification. Furthermore, the specification teaches "LiFePO<sub>4</sub>" (x = 1) is preferred (see Examples). All specific cathode active material compounds represented by Li<sub>x</sub>Fe<sub>y</sub>PO<sub>4</sub> that are disclosed by the specification have x = 1. Thus, Applicant did not have possession of "1 < x ≤ 2".

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 21 and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 21 recites the anode conductive agent comprises "D<sub>s</sub>E<sub>t</sub>Li<sub>u</sub>", however, "E" is not defined by the claim or the specification.

Claim 22 recites an alloy "Mg<sub>2</sub>SaANi<sub>2</sub>Si", which is indefinite. Specifically, neither "Sa" nor "A" are recognized elements and are not defined.

To the extent the claims are understood in view of the 35 U.S.C. 112, 1<sup>st</sup> and 2<sup>nd</sup>, rejections above, note the following prior art rejections.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States:

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Claims 1, 4, 8, 9, 14-19, 21 and 23-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Inamasu, JP 10-312789.

Inamasu teaches a nonaqueous electrolyte secondary battery comprising an active material phosphoric acid compound of the formula  $\text{Li}_x\text{FePO}_4$  (x depends of the valence of Fe) for the positive or negative electrode active material (0007,0011). Note iron has two possible valence states, 2+ or 3+, and phosphate has a 3- charge. Therefore,  $0 \leq x \leq 1$ . The  $\text{Li}_x\text{FePO}_4$  active material has an average grain size of 0.1-100  $\mu\text{m}$  (0020). Examiner points out that  $\text{Li}_x\text{FePO}_4$  is a preferred compound disclosed by the present specification on page 5. It is important to use a small active material to improve cycle characteristics of the battery (0007). When the phosphoric acid compound is used as the positive active material, the negative active material may be a carbon material such as graphite, lithium or a lithium alloy. Graphite intercalates (dopes) lithium (0018). Lithium metal, lithium alloy and carbon material are all typical materials used for the negative electrode active material of the nonaqueous secondary battery (0002-0004). The electrode materials may be sintered (0023). The nonaqueous electrolyte may include an electrolyte solution comprising an organic solvent (e.g., propylene carbonate) and an electrolyte salt (e.g.,  $\text{LiClO}_4$ ) (0012).

The electrodes may include conductive agents, binders or fillers (0013). The electrodes are configured into a film-like structure (molded body) (0009). The negative electrode may include silicon or germanium ( $t=0$  and  $u=0$ ) (0018).

Thus the claims are anticipated.

***Claim Rejections - 35 USC § 103***

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 4, 8, 9, 14-19 and 21-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamauchi et al., US 5,705,296 in view of Moriguchi et al., US 6,576,369 and further in view of Goodenough et al., US 5,910,382.

Kamauchi teaches a lithium secondary battery comprising a positive electrode, a negative electrode and an electrolyte wherein the positive electrode is composed of a lithium-cobalt phosphate positive active material. The lithium-cobalt phosphate is preferably  $\text{LiCoPO}_4$  (col. 4, lines 16-19) and the active material may comprise only  $\text{LiCoPO}_4$  (col. 4, lines 32-34). Transition metals besides cobalt such as Ni, Fe, Mn, Cr and V may be contained in the lithium-phosphate positive active material (col. 4, lines 42-44). The negative electrode may be a carbon material doped with lithium ion (col. 6, lines 15-23). The electrolyte comprises a electrolytic salt and a nonaqueous solvent (col. 7, lines 45-60). The positive electrode may comprise at least the lithium-transition metal phosphate active material, an electrical conducting agent and a binder (col. 4, lines 61-65). The mixture is blended and formed into a positive electrode having desirable shape and size by a known method such as compression molding (col. 5, lines 18-22). The carbon active material of the negative electrode is mixed with a binder and formed into a carbon negative electrode of a desirable shape and size by compression molding (col. 7, lines 40-44). The positive active material has an average particle size of 0.01-20  $\mu\text{m}$  (col. 2, lines 47-66). The carbon material of the negative electrode may be graphite (col. 7, lines 38-39). The

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electrolyte solution includes a solvent and a salt. The salt may be  $\text{LiClO}_4$  and the solvent may be propylene carbonate (col. 7, lines 45-60).

Kamauchi does not explicitly teach the carbon negative electrode comprises a sintered carbon material.

However, Moriguchi teaches a lithium secondary battery having an anode comprising a graphite (carbon) material. A conventional method is used to produce the negative electrode of Moriguchi. As employed in prior art lithium secondary batteries, a graphite powder is applied to a metal base serving as a current collector with the aid of a suitable binder and is shaped thereon. Alternatively, a sintered electrode may be produced from the graphite powder without use of a binder. Thus, the negative electrode may be comprised predominantly or solely of the graphite powder (col. 15, lines 31-39).

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Moriguchi teaches it is conventional to produce a sintered graphite material anode without use of a binder. One of skill would have been motivated to use a the conventional sintered graphite anode of Moriguchi as the anode for the lithium battery of Kamauchi because the prior art teaches such anodes are well known for use in lithium batteries. Moriguchi teaches both carbon electrodes formed with a binder, taught by Kamauchi, and sintered electrodes (without binder) are conventional methods for forming carbon negative electrodes for lithium batteries.

Kamauchi does not have a specific example wherein the positive electrode active material is a lithium iron phosphate ( $\text{Li}_x\text{Fe}_y\text{PO}_4$ ).



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However, Goodenough teaches cathode materials for secondary lithium batteries having the formula  $\text{LiMPO}_4$  wherein M is at least one first row transition-metal cation. M is preferably Mn, Fe, Co, Ti or Ni or a combination thereof. Preferred cathode materials include  $\text{LiFePO}_4$  and  $\text{LiCoPO}_4$  (col. 2, lines 12-34).

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one of skill would have been motivated to use the  $\text{LiFePO}_4$  positive active material of Goodenough for the  $\text{LiCoPO}_4$  (or lithium-transition metal phosphate) positive active material of Kamauchi because Goodenough teaches both positive active materials are known for use in lithium secondary batteries. Furthermore, Kamauchi clearly at least suggests the  $\text{LiFePO}_4$  positive active material compound. Kamauchi teaches transition metals besides cobalt such as Ni, Fe, Mn, Cr and V may be contained in the lithium-phosphate positive active material (col. 4, lines 42-44).

### ***Response to Arguments***

Applicant's arguments filed 6/29/04 have been fully considered but they are not persuasive.

The objections to claims 1 and 12 have been withdrawn.

The double patenting rejection of claims 10-13 have been withdrawn.

### **35 U.S.C. 112, 1<sup>st</sup>**

Claims 1, 4, 8, 9, 14-19 and 21-26 are rejected under 35 U.S.C. 112, 1<sup>st</sup>, as being non-enabled and for containing new matter.

### **35 U.S.C. 112, 2<sup>nd</sup>**

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All 35 U.S.C. 112, 2<sup>nd</sup>, rejections contained in the Action of 3/29/04 have been withdrawn. However, claims 21 and 22 are newly rejected under 35 U.S.C. 112, 2<sup>nd</sup>.

35 U.S.C. 102(b)

The 35 U.S.C. 102(b) rejection of claims 4, 6, 19-21 and 23-26 in view of Koichiro has been withdrawn.

35 U.S.C. 103(a)

Applicant argues Kamauchi does not teach or suggest a non-aqueous secondary cell wherein the positive electrode is comprised of lithium iron phosphate. Examiner disagrees with applicant because Kamauchi at least suggests a positive electrode active material containing lithium iron phosphate in column 4, lines 42-44. Kamauchi does not require any specific molar ratio of cobalt:phosphorus:lithium as asserted by Applicant. This is only an embodiment of Kamauchi and the reference is not limited to any particular embodiment. Kamauchi teaches transition metals besides (instead of) cobalt such as iron may be contained in the lithium phosphate active material. Thus, it is unclear how Applicant reached the conclusion that Kamauchi teaches away from a lithium iron phosphate positive active material. While Kamauchi does not teach a specific example of a lithium iron phosphate compound, Kamauchi at least suggests a lithium iron phosphate compound. Furthermore, Goodenough is cited in combination with Kamauchi to teach the lithium iron phosphate limitation of the instant claims.

(Note that the previous office action contained a typographical error, page 8, line 5 should have stated "Kamauchi does *not* have a specific example wherein the positive electrode active material is a lithium iron phosphate. This error has been corrected.)

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Regarding Moriguchi, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Moriguchi is not cited for teaching the cathode material. This limitation is taught by Goodenough and Kamauchi.

Applicant states Goodenough does not teach or suggest the claimed invention. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

All elements are taught by the combination of references (Kamauchi, Moriguchi and Goodenough). Applicant has not addressed the motivation provided by the Examiner for combining the references.

The instant claims are directed toward a known anode and a known cathode. Simply combining a known anode and a known cathode for a non-aqueous secondary battery is considered obvious. Contrary to Applicant's assertion, there is a reasonable expectation of success in combining a known anode and a known cathode for a non-aqueous secondary battery.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is 571-272-1285. The examiner can normally be reached on Monday-Thursday (9:00-7:30).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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August 13, 2004